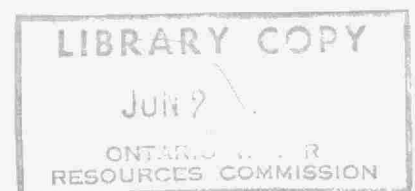




**THE
ONTARIO WATER RESOURCES
COMMISSION**

**REPORT ON
WATER POLLUTION SURVEY
of the
NAPANEE RIVER
with a pertinent
SANITARY SURVEY REPORT
on the
TOWN OF NAPANEE**

February 27th to March 1st
July 17th and 18th
1961



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REPORT ON
WATER POLLUTION SURVEY
OF THE
NAPANEE RIVER
WITH A PERTINENT
SANITARY SURVEY REPORT
ON THE
TOWN OF NAPANEE

BY:

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District Engineer

February 27 to March 1
July 17th and 18th, 1961

REPORT ON
WATER POLLUTION SURVEY OF THE NAPANEE RIVER

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WATER POLLUTION SURVEY

1

OF THE NAPANEE RIVER

INTRODUCTION

Prompted by a request from officials of the Napanee Valley Conservation Authority, a water pollution survey of the Napanee River was conducted by Commission staff during the period of February 27th to March 1st, and on July 17th and 18th, 1961. Two sets of samples were collected each from private, municipal and industrial outfalls, as well as from the waters of the Napanee River and its tributaries at appropriate locations.

GENERAL

The co-operation which was received from the various officials as listed below, and from other persons interviewed during these investigations, is appreciated:

Napanee Valley Conservation Authority

Mr. G. Grant, Chairman, R.R. 1, Verona;

Mr. C. Knight, Secretary-Treasurer, Napanee

Lennox and Addington Health Unit

Mr. G. Yarrow, Sanitary Inspector

Town of Napanee

Mr. M. C. Graham, Town Clerk;

Mr. E. Leaver, Deputy Clerk;

Mr. Lloyd Woolsey, member of town council and Chairman of the Sanitation and Waste Removal Committee;

Mr. T. Powell, Works Foreman.

An acknowledgement is made to the Ontario Department of Commerce and Development for information obtained from the Napanee Valley Conservation Report.

NAPANEE RIVER WATERSHED

Geography of Area

The Napanee River system drains an area of approximately 316.3 square miles. The drainage area resembles a funnel in shape, with the small end thereof opening into the Bay of Quinte. The greatest length of the watershed is approximately 32 miles. The greatest width is approximately 18 miles.

The sources of the Napanee River are three main tributary streams, namely: Depot Creek, Hardwood Creek and Cameron Creek. Depot Creek and Cameron Creek converge one mile south of the community of Bellrock and flow into Napanee Lake which also receives the flows from Hardwood Creek. The well-defined section of the Napanee River is from Napanee Lake to the Bay of Quinte. The most important tributary is the Depot Creek since it drains a chain of six lakes known as the Depot Lakes which are numbered consecutively northward from First Depot to Sixth Depot Lake. Lying farther south, Camden Lake and Varty Lake are the largest bodies of water within the watershed, and are drained to the Napanee River by Cameron Creek and Varty Creek, respectively.

The Cameron Swamp covers approximately 8,000 acres, and extends from Highway #38 to Camden Lake. This swamp collects the flows from numerous tributary streams, which in turn discharge to the main watercourse.

Gradients on the Napanee River system are comparatively steep. The main watercourse reportedly drops approximately 200 feet during its southerly course from the Cameron Swamp to the Town of Napanee. In this distance of approximately 16 miles, the average gradient would, therefore, be 12.5 feet per mile. The numerous falls and rapids in this section of the watercourse provided attractive locations for water-powered grist-mills and saw-mills during the early days of settlement in the watershed.

Downstream from the Town of Napanee, the river has the appearance of an estuary and has been employed for navigation purposes.

The somewhat rusty colour of the waters in the Napanee River may be attributed to the mineralogy of the Precambrian bedrock in the northern reaches of the stream, and to the boggy characteristics of the Cameron Swamp.

Geology of Area

The watershed contains two major types of bedrock. To the north of the Cameron Swamp is found the Precambrian bedrock formation of the Canadian Shield, while to the south lie the more recent sedimentary limestones and shales of the Ordovician age.

The northern region is more suitable for recreational pursuits than agriculture. Although sections of the southern region afford fertile tracts of farmland, there are many areas where the thin soil cover is not suitable for agriculture.

MUNICIPALITIES

The following municipalities lie either wholly or partly within the Napanee Watershed:

In the County of Lennox and Addington:

- Town of Napanee
- Village of Newburgh
- Township of Camden
- Township of Ernestown
- Township of Fredericksburgh North
- Township of Richmond
- Township of **Sheffield**

In the County of Frontenac:

- Township of Bedford
- Township of Hinchinbrooke
- Township of Kennebec
- Township of Loughborough
- Township of Portland

The incorporated centres of urban population which may be considered of major size within this watershed are the Town of Napanee and the Village of Newburgh, both located in the County of Lennox and Addington. Smaller communities, all of which lie in the southern part of the watershed, include Yarker, Camden East, Verona, Enterprise, Moscow, Strathcona, Bellrock and Centreville.

In conjunction with this water pollution survey of the Napanee River, a municipal sanitary survey was conducted at the Town of Napanee.

The Town of Napanee covers an area of approximately 1,480 acres with a population of 4,505 according to the 1961 Municipal Directory. Systems of municipal storm sewers discharge to the Napanee River. Municipal sewage works consist of sanitary sewers, 2 sewage pumping stations, and a primary-type sewage treatment plant discharging to the Napanee River. The town's water supply is drawn from the river upstream from the sewage treatment plant outfall.

WATER USES

Municipal use of the Napanee River is limited to the Town of Napanee where it is employed as the source of municipal water supply, and as the receiving water for the municipal sewage treatment plant effluent.

At communities located near the river and upstream from Napanee, water is supplied from private wells. The private sewage disposal facilities employed there consist of septic tank systems and privies.

Industrial use of the Napanee River system is of some importance.

The Strathcona Paper Company Limited plant at Strathcona draws heavily on the waters of the river for industrial purposes. The industrial wastes therefrom are discharged to a series of waste stabilization ponds and thence to the river.

The Newburgh Milk Products Limited plant at Newburgh discharges a portion of its industrial wastes to a small tributary of the Napanee River.

Private use of the Napanee River may occur to an extent which is not immediately known.

Partially treated sanitary wastes are discharged from the Strathcona Paper Company Limited plant to the watercourse.

Recreational use of the Napanee River is of considerable importance due, in part, to the rural nature of the watershed.

HYDROLOGY

Precipitation records are available from the Climatology Section, Meteorological Division, Department of Transport. Measurements which have been recorded at a station in this vicinity indicate an average annual precipitation of approximately 32.82 inches.

Stream flow data for the Napanee River have been recorded over a period of years. A hydrometric gauging station is located at the bridge on the Newburgh Road, approximately 2-1/2 miles north-east of Napanee. This gauging station was operated from 1915 to 1926, and from 1945 to date. Another gauging station has been established on Depot Creek at Bellrock since January 1957, which may not be a sufficient period of time for ascertaining extreme variations of flow.

The following provisional stream flow data pertaining to sampling dates are supplied by the Water Resources Branch, Department of Northern Affairs and National Resources:

<u>Location of Stream Gauging Station</u>	<u>Dates of Sampling 1961</u>	<u>Flows Recorded (in c.f.s.)</u>
Napanee River at bridge on Newburgh Road:	February 28th	538
	March 1st	395
	July 17th	111
	July 18th	105
Depot Creek at Bellrock:	February 28th	19.6 . ice
	March 1st	28.6 . cond-
	July 17th	22.7 . itions
	July 18th	22.7 .

The extreme flows recorded in the Napanee River at the Newburgh Road stream gauging station are reported as follows:

Maximum - 3400 c.f.s. in April 1950

Minimum - 1 c.f.s. in October 1920

These flows may not be truly indicative of the natural flows in the watercourse since the operation of dams and associated control works could exert some influence thereon. The inauguration of water conservation measures may have assisted in retarding rapid surface run-off flows which normally occur during spring months.

The Napanee Valley Conservation Authority was established in 1947 and has been instrumental in encouraging effective land use, water conservation and flood control. By means of reforestation and the impounding of waters, efforts have been made to control seasonal variations of flows in the river. The construction of the Second Depot Lake dam was a notable accomplishment of the Authority in its attempt to impound excessive surface run-off flows for subsequent release to augment depleted stream flows in the river.

SAMPLING PROCEDURE

The locations of sampling points are shown on the appended map of the Napanee River watershed and the map of the Town of Napanee. "Grab" samples were collected, 40-ounce samples being taken for sanitary chemical analysis, and 6-ounce samples for coliform determination. Analyses and examinations were performed at the Ontario Water Resources Commission laboratory, Toronto.

The most common analyses of sanitary significance are: Biochemical Oxygen Demand, Suspended Solids, and the total coliform determination, which was obtained by the membrane filter technique and is reported as a Membrane Filter Coliform Count.

Biochemical Oxygen Demand (B.O.D.)

The B.O.D. of sewage, industrial wastes or polluted waters, is the oxygen required during stabilization (natural purification in a stream) of the decomposable organic matter or chemical material, by aerobic biochemical action. Unless otherwise noted, a 5-day B.O.D. determination is performed, and is reported in parts per million (ppm.) A high B.O.D. is indicative of recent organic or chemical pollution. A desirable upper limit in natural surface water normally is 4 parts per million.

Suspended Solids

These results are reported in parts per million and indicate the measure of undissolved solids of organic or inorganic nature. Where suspended solids values approach 20 parts per million or less, laboratory difficulties may result in these values being determined as turbidity and are reported in silica units.

Membrane Filter Coliform Count

The membrane filter technique is employed to obtain a direct enumeration of coliform organisms and is reported per 100 millilitres. Waters having a membrane filter count in excess of the upper limit of 2,400 organisms are considered undesirable for municipal water supplies or bathing purposes.

Additional specific tests are employed in some instances to determine the nature and significance of industrial waste discharges. Samples were collected from the Napanee River, at several locations, to determine the presence of phenol.

Dissolved oxygen tests were performed at two sampling locations on July 17th. The results thereof are included in Table I.

SAMPLING CONDITIONS

February 28th and March 1st

Downstream from Napanee, the watercourse remained ice covered during this survey. Several inches of water lying on the ice cover prevented the collecting of representative stream samples in this section of the river where the slow flows permit a thick ice formation. The absence of an ice cover on the watercourse upstream from Napanee permitted the collecting of samples thereof.

July 17th and 18th

Normal seasonal conditions prevailed in the watershed at this time.

SAMPLING RESULTS

The results of stream and outfall samples are shown in Tables I to V inclusive, which are appended to this report.

Napanee River

The laboratory results of samples collected from the Napanee River system are appended in Table I, and indicate generally satisfactory conditions with respect to sanitary chemical quality and coliform content.

The high B.O.D. revealed on July 18th at the mouth of the watercourse, where the river widens at the Bay of Quinte, is attributed to floating algal material in the bay, which was visible at the time of sampling.

The coliform content in the river water at sampling point #N.4.7, just downstream from Napanee, was revealed on July 18th to be slightly in excess of this Commission's acceptable upper limit.

The phenol concentrations in the river water downstream from the Strathcona Paper Company Limited outfall were, at the times of sampling, within satisfactory limits.

During both periods of sampling, gross pollution was revealed in the small tributary of the Napanee River which receives untreated industrial waste discharges from the Newburgh Milk Products Limited plant.

The Dissolved Oxygen tests which were performed at two sampling locations on July 17th revealed normal seasonal conditions with respect thereto in the watercourse.

Municipal Storm Drainage Outfalls

Sample results, as shown in Table II, reveal the unsatisfactory qualities of flows discharging to the Napanee River on February 28th from four municipal storm sewer outlets within the Town of Napanee. Flows were not evident at most of these storm drainage outfalls during the July sampling program.

Municipal Sewage Works Outfalls

In Table III are shown the laboratory results of samples collected from outfalls which are pertinent to the municipal sewage works in Napanee. Samples were taken from the municipal sewage treatment plant effluent on February 28th and July 18th.

Similarly shown are the laboratory results of samples taken at the Napier Street sewage pumping station on February 28th where sewage flows in excess of the pumping capacity were being discharged without prior treatment to the Napanee River. There was no overflow from this sewage pumping station on July 18th when the pumping capacity appeared to be adequate during the absence of storm water flows in the sewer system.

Industrial Outfalls

The Strathcona Paper Company Limited plant at Strathcona employs a series of waste stabilization ponds for treating industrial waste flows. The high 5-day B.O.D. and Total Solids values of the flows emanating from the final lagoon to the Napanee River on March 1st are shown in Table IV and would cast doubt on the adequacy of treatment provided for these waste discharges. The phenol content therein is higher than the objective of this Commission, although these values were not reflected greatly in the river samples collected downstream.

The laboratory results of samples collected from the watercourse on July 17th and 18th do not indicate that these industrial wastes were affecting the quality of the river water to an appreciable extent at that time, although it is of some significance to note that the plant was not operating during this latter period of sampling.

The Strathcona Paper Company Limited has been attempting, in co-operation with this Commission, to provide adequate industrial waste treatment facilities.

The Newburgh Milk Products Limited plant is located near a small tributary of the Napanee River within the Village of Newburgh. The industrial wastes, exclusive of wash waters, are removed from the plant for spraying in roadside ditches. Wash waters are discharged to the local creek without prior treatment, as is revealed by the sample results in Table I.

Following inspections of the industrial waste disposal procedures at this plant during recent years, members of the Commission staff have recommended the use of spray irrigation or other adequate methods of disposal.

Private Outfalls

Table V shows the laboratory results of samples taken from the partially treated sanitary wastes discharging from the Strathcona Paper Company Limited plant to the Napanee River. The sanitary waste flows at this plant are discharged to a septic tank and usually are chlorinated prior to their discharge to the river. The appended sample results indicate that the B.O.D. of this waste is characteristic of septic tank effluents. The excessive coliform content revealed in this discharge on July 17th suggests that, during the cessation of industrial activity at this plant, chlorination of the sanitary wastes had been discontinued. These values exceed the objectives of this Commission for wastes discharging to a watercourse.

SUMMARY

A water pollution survey of the Napanee River and its tributaries was conducted during the periods of February 27th to March 1st, and on July 17th and 18th, 1961.

Generally satisfactory conditions were revealed in the watercourse during these periods of sampling. Ice conditions prevented the collecting of representative samples from the Napanee during the initial sampling programme.

Within the Town of Napanee, flows of an unsatisfactory sanitary chemical quality were discharging from four municipal storm sewer outlets to the river within the Town of Napanee during the initial sampling programme. These flows were absent during the latter period of sampling in July.

Untreated sewage flows were bypassing the Napanee sewage treatment plant and the Napier Street sewage pumping station on February 28th, and were discharging to the Napanee River. Heavy seasonal surface run-off flows were contributing to this occurrence. This bypassing was not occurring on July 18th.

Concentrations of phenol were revealed in the river downstream from the Strathcona Paper Company Limited plant, but were within this Commission's acceptable limit. The partially treated sanitary waste flows emanating from the private sewage treatment works at this plant were of an unsatisfactory quality for discharge to a watercourse.

Untreated industrial wastes are discharged from the Newburgh Milk Products Limited plant to a local tributary of the Napanee River.

RECOMMENDATIONS

Within the Town of Napanee, local officials should adopt a programme to exclude untreated or inadequately treated wastes from the municipal storm sewer system. These and other pertinent problems existing within the town are described at greater length in the appended report on the "Municipal Sanitary Survey of the Town of Napanee".

Efforts should be continued at the Strathcona Paper Company Limited plant to provide effective methods of industrial waste treatment. The methods of sewage disposal practised at this plant should be revised, either to provide adequate treatment of the sanitary waste flows presently discharging to the Napanee River, or to exclude these wastes from the watercourse.

Although the industrial waste disposal procedures at the Newburgh Milk Products Limited plant have been altered somewhat in an attempt to comply with requests made by this Commission, further action is necessary in order to exclude all of these untreated industrial waste flows from the watercourse.

MUNICIPAL SANITARY SURVEY OF THE TOWN OF NAPANEE

GENERAL

In conjunction with this water pollution survey of the Napanee River, an associated municipal sanitary survey was conducted of the Town of Napanee with respect to water supply, sewage disposal, storm water disposal, and any condition which could affect the quality of the river water. Investigations were made to determine the source and significance of outfalls discharging to the Napanee River within this municipality.

The Town of Napanee straddles the Napanee River at a location approximately four miles upstream from its mouth at the Bay of Quinte. The town has a population of approximately 4,505 and has a total area of 1,480 acres.

GEOGRAPHY AND GEOLOGY

The town is drained either directly to the Napanee River, or to improved drainage courses discharging thereto.

This municipality is built on the fissured limestone bedrock which prevails in this general area.

HEALTH SERVICES

The Lennox and Addington Health Unit performs an important role with respect to the supervision of the installation of private sewage disposal systems in sections of Napanee where municipal sanitary sewers are not available.

WATER SUPPLY

The town's water supply is delivered by gravity to the water purification plant from a canal which diverts water from the Napanee River. Treatment consists of coagulation, sedimentation, pressure filtration and chlorination. Chlorine dioxide treatment is employed to combat chlorophenol taste problems. Post-chlorination treatment is provided.

The treatment capacity of the water works plant is rated at 1.9 million gallons per day. The average daily consumption of water reportedly approximates 785,000 gallons, with seasonal fluctuations from 625,000 gallons to 1,090,000 gallons.

Improvements are being made presently at this water works in order to provide better flexibility of operation with respect to the varying demand of the town, and the changing quality of the supply.

Napanee's waterworks system is operated by the local Public Utilities Commission.

SEWAGE WORKS

The larger section of the town lies to the west of the river and is served by a sewer which conducts sewage flows to the municipal sewage treatment plant. These works are located on the western bank of the river near the downstream limit of the municipality.

Included in the municipal sewerage system are two sewage pumping stations, the locations of which are shown on the appended map of the Town of Napanee. The following is a brief description of the locations and emergency overflow arrangements at these sewage pumping stations:

1. Belleville Road pumping station
 - located south-west of the junction of Belleville Road and Graham Street.
 - no emergency discharge arrangement.
2. Napier Street pumping station
 - located at the foot of Napier Street near the river bank.
 - emergency discharge to the Napanee River.

The Napier Street sewage pumping station was overflowing to the river at the time of the inspection on February 28, 1961, during a period of heavy surface run-off.

The Town of Napanee sewage treatment plant is a primary type plant with a design capacity of 750,000 gallons per day. The various sections of the plant include grit removal channels, comminutor, primary clarifier, sludge digester, sludge drying beds, and sludge pumping equipment. No chlorination treatment is provided. The outfall sewer terminates in the Napanee River approximately 300 feet from shore in approximately 3 feet of water. The depth of water covering the termination of the outfall sewer would, however, vary according to seasonal conditions and the manipulation of upstream flow control works.

Samples were collected on February 28th to show the sanitary chemical quality and coliform content of the flows discharging from the sewage treatment plant and the Napier Street sewage pumping station. A portion of the sewage flows approaching the sewage treatment plant at that time were bypassing the treatment works and discharging through the plant outfall sewer. This condition was apparently attributable for the most part to a minor obstruction occurring accidentally in the grit removal channel, which subsequently was corrected. The laboratory results obtained from the analysis of these samples, as well as of additional samples taken subsequently on July 18th, are shown in Table III. During the latter inspection on July 18th, no flows were bypassing the sewage treatment plant or the sewage pumping station.

The following laboratory results indicate the efficiency of sewage treatment provided at this plant at the times of sampling on February 28th and July 18th, 1961:

<u>Date of Sample</u>	<u>Lab. No.</u>	<u>Location of Sample</u>	<u>5-Day</u>	<u>Solids (ppm.)</u>			<u>M.F. Coliform Count/100 ml.</u>
			<u>B.O.D.</u> (ppm.)	<u>Total</u>	<u>Susp.</u>	<u>Diss.</u>	
Feb. 28	R-366	Influent to Napane S.T.P.	170	392	78	314	Sample bottle broken in transit
July 18	6115		115	376	72	304	11,700,000
Feb. 18	R-367	Effluent from Napane S.T.P.	80	374	70	304	Sample bottle broken in transit
July 18	6116		70	406	56	350	17,000,000

The 52 per cent reduction in 5-Day B.O.D. content indicated on February 28th is within the range which is expected of primary treatment facilities. The suspended solids content has not been reduced to a similar extent.

The 39 per cent reduction in 5-Day B.O.D. content indicated on July 18th is somewhat less than desirable.

An excessive coliform content was revealed in the sewage treatment plant effluent at the time of sampling.

For a more detailed description of the Napanee sewage treatment plant, reference should be made to the report prepared by Mr. P. G. Cockburn, P. Eng., Assistant District Engineer with this Commission, following his inspection of this plant early in 1961.

The section of the town lying east of the river is not served by municipal sanitary sewers. Septic tank systems and privies are employed there.

STORM DRAINAGE

Networks of storm sewers and improved drainage courses serve the Town of Napanee and discharge to the Napanee River. Flows were observed and sampled at the outlets from four municipal storm sewers, one improved drainage course, and one small water-course. These sampling points and the pertinent laboratory results are tabulated in Table II. The sampling locations are as follows:

1. A municipal storm sewer has its outfall on the river bank at the foot of Robinson Street. This storm sewer conducts drainage from the western part of the municipality, as well as some flows from beyond the corporation limit.

2. A municipal storm sewer outlet is located on the west bank of the river at the Centre Street bridge, north side.
3. A municipal storm sewer has its outfall on the river bank at the foot of John Street.
4. A municipal storm sewer terminates on the river bank at the foot of East Street.
5. An improved drainage course originating in the vicinity of Highway #41 and Dairy Avenue, discharges to the river approximately 500 feet north of the C.N.R. bridge. This ditch conducts flows from the local Acme Farmers Dairy Limited plant. The results of analyses performed on samples taken where this drainage course discharges to the river did not reveal the presence of milk waste at the time of sampling.
6. A small surface drainage course terminates on the east bank of the river opposite Robinson Street. There was no apparent contamination in this drainage course at the time of sampling.

The results of the laboratory analyses indicate the presence of a high 5-Day B.O.D. content, and in some instances a high coliform content, in these storm sewer discharges. These values generally are indicative of sanitary waste flows, which should not be permitted to discharge to a storm sewer and thence to a watercourse without adequate prior treatment.

Satisfactory conditions were revealed in the two surface drainage courses at the times of sampling.

INDUSTRIAL OUTFALLS

Investigations were made in order to determine the methods of waste disposal employed by industrial firms in Napanee. The only apparent potential discharge of industrial waste to a watercourse in Napanee, would be from the Acme Farmers Dairy Limited plant (recently purchased by Pet Milk Company (Canada) Limited. There was no indication during this

survey that offensive wastes discharge therefrom to the pertinent drainage course, as is corroborated by the results of samples taken from the Dairy Avenue drainage ditch on February 28th and July 17th, 1961.

REFUSE DISPOSAL SITE

An inspection of the refuse disposal site located on the west bank of the Napanee River between Napier Street and Hessford Street revealed the unsatisfactory condition thereof. This disposal site was developed originally on private premises but through indiscriminate operation it has encroached on the river bed until considerable land has been reclaimed from the watercourse. Accumulations of waste material have been placed on the river bank and have been permitted to gain access to the stream.

Following the inspection of this refuse disposal site by Commission staff on March 2nd, 1961, a report was prepared and distributed to the appropriate persons, recommending either a revision of operational procedures at this site, or the selection of a more suitable disposal area. Information obtained during the latter investigations in July revealed that no action had been taken to comply with this request.

SUMMARY

A municipal sanitary survey of the Town of Napanee, with respect to any condition which could affect the quality of the waters in the Napanee River, revealed the following

unsatisfactory conditions during the period of February 27th to March 1st, and on July 17th and 18th, 1961:

(a) Untreated sewage flows were bypassing the municipal sewage treatment plant and the Napier Street sewage pumping station on February 28th, 1961. The discharging of these flows to the Napanee River was attributed, in part, to the heavy surface run-off flows occurring at that time, and the apparent existence of some combined sewers.

(b) The sanitary chemical quality of samples collected from four municipal storm sewer outfalls, at locations described previously in this report, indicated the presence of untreated sanitary waste therein on February 28th.

(c) The refuse disposal site utilized by the town, and located on the west bank of the Napanee River, is unsatisfactory both with respect to location and method of operation. Refuse material has been deposited in and near the watercourse in such a manner as to reclaim land therefrom. Waste material and seepage from this refuse disposal site undoubtedly gain access to the Napanee River. Although a report on this refuse disposal site was prepared and distributed following the initial inspection thereof on March 2nd, 1961, subsequent enquiries in July revealed that no remedial action had been taken.

RECOMMENDATIONS

Care should be exercised in order to avoid the unnecessary bypassing of sewage at the Napanee sewage treatment plant. Frequent inspections will assist in this matter. Measures should be adopted to prevent the unnecessary bypassing of flows at the Napier Street sewage pumping station.

The Town of Napanee should undertake a programme to exclude all untreated or inadequately treated wastes from the municipal storm sewer system.

Operational procedures should be revised at the refuse disposal site located on the bank of the Napanee River. If possible, another site should be obtained and utilized at a location where the refuse material will not gain access to a watercourse.

RIVER SURVEY

WATERSHED: NAPANEE RIVER

WATERCOURSE:

A. McCONNELL

DATE SAMPLED: SEE BELOW BY: R. BARRENS

DATE SAMPLED 1961	SAMPLE POINT NO.	LAB. NO.	5-DAY B.O.D.	SOLIDS			pH AT LAB.	TURBIDITY IN SILICA UNITS	PHENOLS IN (PPB)	BACTERIOLOGICAL LABORATORY	
				TOTAL	SUSP.	DISS.				LAB. NO.	M.F. COLIFORM COUNT PER 100 ML.
JULY 18	N.0.0	R-2312	60.	366	--	--	--	42	--	R-7680	100
JULY 18	N.0.5	R-2313	2.7	212	--	--	--	3	--	R-7681	0
JULY 18	N.3.5	R-2314	1.2	224	--	--	--	2	--	R-7682	260
JULY 18	N.4.7	R-2315	1.8	230	--	--	--	2	--	R-7683	2,850
JULY 18	N.6.0	R-2316	5.0	230	--	--	7.6	3	0	R-7539	10

R-2312 NAPANEE RIVER AT BAY OF QUINTE

R-2313 NAPANEE RIVER NORTH SHORE $\frac{1}{2}$ MILE UPSTREAM FROM BAY

R-2314 NAPANEE RIVER BESIDE HWY. NO.4 2 MILES BELOW NAPANEE

R-2315 NAPANEE RIVER ONE MILE BELOW NAPANEE AT POWER LINE CROSSING

R-2316 NAPANEE RIVER AT BRIDGE IN NAPANEE
(NO SAMPLES WERE COLLECTED AT ABOVE LOCATIONS ON FEBRUARY 28TH DUE TO ADVERSE SAMPLING CONDITIONS)

T A B L E 1

R I V E R S U R V E Y

WATERSHED: NAPANEE RIVER

WATERCOURSE:

DATE SAMPLED: SEE BELOW BY: A. McCONNELL
R. BARRENS

DATE SAMPLED 1961	SAMPLE POINT NO.	LAB. NO.	5-DAY B.O.D.	SOLIDS			D.O.	SAMPLE TEMP. C	TURBIDITY IN SILICA UNITS	PHENOL IN (P.P.B.)	PH AT LAB.	BACTERIOLOGICAL LABORATORY	
				TOTAL	SUSP.	DISS.						LAB. NO.	M.F. COLIFORM COUNT PER 100 ML.
FEB. 28	N.6.4	R-368	2.4	108	--	---			5	4	7.7	R-1470	1,060
MAR. 1		R-381	4.2	178	--	---			8	2	8.1	R-1499	330
JULY 18		R-2319	0.3	218	--	---			2	0	--	R-7542	22
FEB. 28	N.9.3	R-369	3.0	130	--	---			6	3	7.8	R-1471	230
MAR. 1		R-380	4.0	166	--	---			8	3	8.1	R-1498	210
JULY 17		R-2320	0.5	216	--	---	5.6	25°	1	2	7.7	R-7527	370
MAR. 1	N.12.0	R-379	3.7	176	--	---			8	--	--	R-1497	130
JULY 17		R-2321	6.0	230	--	---			5	0	7.7	R-7528	530

R-368)
R-381) NAPANEE RIVER AT BRIDGE JUST NORTH-EAST OF NAPANEE ON ROAD TO NEWBURGH
R-2319)

R-369)
R-380) NAPANEE RIVER AT BRIDGE 2½ MILES ABOVE NAPANEE ON NEWBURGH ROAD
R-2320)

R-379 NAPANEE RIVER AT BRIDGE - STRATHCONA SIDE-ROAD

T A B L E 1 (CONTINUED)

R I V E R S U R V E Y

WATERSHED: NAPANEE RIVER

WATERCOURSE:

DATE SAMPLED: SEE BELOW BY: A. D. McCONNELL, R. BARRENS

DATE OF SAMPLE 1961	SAMPLE POINT NO.	LAB. NO.	5-DAY B.O.D.	SOLIDS			D.O.	SAMPLE TEMP. C	PH AT LAB.	TURBIDITY IN SILICA UNITS	PHENOL IN (P.P.B.)	BACTERIOLOGICAL LABORATORY	
				TOTAL	SUSP.	DISS.						LAB. NO.	M.F. COLIFORM COUNT PER 100 ML.
MAR. 1	N.N.13.8	R-373	280.	654	42	642	--			--	--	R-1491	211,000
JULY 17		R-2323	1200.	1542	548	994	--					R-7530	1,340,000
MAR. 1	N.N.13.9	R-374	2.1	268	--	--	--			3	--	R-1492	11
MAR. 1	N.14.0	R-375	3.3	134	--	--	--			8		R-1493	57
JULY 17		R-2322	0.4	200	--	--	6.7	25°	8.4	1	0	R-7529	20
FEB. 28	N.16.4	R-370	3.3	170	--	--				6	--	R-1472	50
JULY 17		R-2324	0.7	208	--	--				1	--	R-7531	50
FEB. 28	N.21.4	R-371	3.4	126	--	--				7		R-1473	19
		R-2325	0.7	212	--	--				1		R-7532	710
MAR. 1	N.22.4	R-385	4.6	158	--	--				8		R-1503	450
JULY 17		R-2326	0.8	208	--	--				1		R-7533	30

R-373 TRIBUTARY OF NAPANEE RIVER DOWNSTREAM FROM NEWBURGH MILK PRODUCTS LTD. OUTFALL
R-2323

R-374 TRIBUTARY OF NAPANEE RIVER UPSTREAM FROM NEWBURGH MILK PRODUCTS LTD. OUTFALL

R-375 NAPANEE RIVER AT BRIDGE AT NEWBURGH

R-2322

R-370 NAPANEE RIVER AT BRIDGE AT CAMDEN EAST

R-2324

R-371 NAPANEE RIVER AT BRIDGE AT YARKER

R-2325

R-385 NAPANEE RIVER AT BRIDGE AT COLEBROOK

R-2326

T A B L E 1 (CONTINUED)

RIVER SURVEY

WATERSHED: NAPANEE RIVER

WATERCOURSE:

DATE SAMPLED: SEE BELOW A. D. McCONNELL
BY: R. BARRENS

DATE OF SAMPLE 1961	SAMPLE POINT NO.	LAB. NO.	5-DAY B.O.D.	SOLIDS			TURBIDITY IN SILICA UNITS	BACTERIOLOGICAL LABORATORY	
				TOTAL	SUSP.	DISS.		LAB. NO.	M.F. COLIFORM COUNT PER 100 ML.
MAR. 1	N.24.6	R-386	5.2	130	-	-	12	R-1504	640
JULY 17		R-2327	0.7	210	-	-	1	R-7534	110
MAR. 1	NV.25.8	R-387	3.8	186	-	-	9	R-1505	9
JULY 17		R-2328	1.1	280	-	-	1	R-7520	220
MAR. 1	NCH.31.6	R-382	2.5	158	-	-	4	R-1500	5
JULY 17		R-2329	1.0	194	-	-	1	R-7521	172
MAR. 1	NCHX.33.6	R-383	2.7	188	-	-	4	R-1501	9
JULY 17		R-2330	0.7	170	-	-	1	R-7522	24
MAR. 1	NCD.32.6	R-388	3.8	84	-	-	7	R-1506	27
JULY 17		R-2331	0.6	138	-	-	1	R-7523	430
MAR. 1	NCD.33.4	R-389	3.5	94	-	-	3	R-1507	8
JULY 17		R-2332	0.8	122	-	-	1	R-7524	210

R-386 NAPANEE RIVER AT BRIDGE AT PETWORTH
R-2327

R-387 VARTY CREEK AT PETWORTH ROAD

R-2328

R-382 HARDWOOD CREEK AT ROAD $\frac{1}{2}$ MILE SOUTH OF VERONA

R-2329

R-383 VERONA LAKE AT ROAD AT JUNCTION WITH CREEK FROM HOWES LAKE $\frac{1}{2}$ MILE EAST OF HWY. NO. 38

R-2330

R-388 DEPOT CREEK AT BRIDGE JUST BELOW BELLROCK

R-2331

R-389 DEPOT CREEK AT BRIDGE $\frac{1}{3}$ MILE ABOVE BELLROCK

R-2332

TABLE 1 (CONTINUED)

R I V E R S U R V E Y

WATERSHED: NAPANEE RIVER

WATERCOURSE:

A. McCONNELL

DATE SAMPLED: SEE BELOW BY: R. BARRENS

DATE OF SAMPLE 1961	SAMPLE POINT NO.	LAB. NO.	5-DAY B.O.D.	SOLIDS			TURBIDITY IN SILICA UNITS	BACTERIOLOGICAL LABORATORY	
				TOTAL	SUSP.	DISS.		LAB. NO.	M.F. COLIFORM COUNT PER 100 ML.
MAR. 1	NCR. 37.8	R-390	3.6	134	-	-	5	R-1508	19
JULY 17		R-2333	0.9	182	-	-	2	R-7525	20
MAR. 1	NC. 37.0	R-391	4.4	138	-	-	6	R-1509	18
JULY 17		R-2334	1.4	250	-	-	1	R-7526	30

R-390 CARMAN CREEK AT ROAD NORTH-EAST OF ENTERPRISE

R-2333

R-391 CAMERON CREEK AT ROAD $\frac{1}{4}$ MILE NORTH OF CAMDEN LAKE

R-2334

T A B L E 1 (CONTINUED)

SEWAGE ANALYSIS

MUNICIPALITY: TOWN OF NAPANEE

SOURCE: MUNICIPAL STORM DRAINAGE OUTFALLS TO NAPANEE RIVER

DATE SAMPLED: SEE BELOW

BY: A. McCONNELL, R. BARRENS

DATE OF SAMPLE 1961	LAB. NO.	5-DAY B.O.D.	SOLIDS			TURBIDITY IN SILICA UNITS	BACTERIOLOGICAL LABORATORY	
			TOTAL	SUSP.	DISS.		LAB. NO.	MEMBRANE FILTER COLIFORM COUNT PER 100 ML.
FEB. 28	R-365	44.0	248	84	164	5	R-1469	500
FEB. 28	R-360	2.1	330	--	--	5	R-1464	20
JULY 18	R-2317	0.8	642	--	--	4	R-7540	70
FEB. 28	R-363	46.0	426	140	286		R-1467	2,600
FEB. 28	R-361	125.0	614	86	528		R-1465	2,110,000
FEB. 28	R-362	50.0	1192	346	846		R-1466	50
FEB. 28	R-359	1.9	220	--	--	2	SAMPLE BOTTLE BROKEN IN TRANSIT	
JULY 17	R-2336	0.6	312	--	--	2	R-7538	11

R-365 N.5.8DS - STORM SEWER OUTFALL AT FOOT OF ROBINSON ST.
NO FLOW - JULY 18TH

R-360 N.5.8D - DITCH TO SOUTH BANK OF RIVER OPPOSITE ROBINSON ST.
R-2317

R-363 N.6.0WS - STORM SEWER AT CENTRE ST. BRIDGE - N.W. SIDE
NO FLOW - JULY 18TH

R-361 N.6.1WS-1 - STORM SEWER - FOOT OF JOHN ST.
NO FLOW - JULY 18TH

R-362 N.6.1WS -2 - STORM SEWER - FOOT OF EAST ST.
NO FLOW - JULY 18TH

R-359 N.6.5D - DRAINAGE DITCH FROM DAIRY AVE. - TO RIVER UPSTREAM FROM C.N.R. BRIDGE
R-2336

TABLE II

SEWAGE ANALYSIS

MUNICIPALITY: TOWN OF NAPANEE

SOURCE: MUNICIPAL SEWAGE WORKS OUTFALLS TO NAPANEE RIVER

DATE SAMPLED: SEE BELOW BY: A. McCONNELL, R. BARRENS

DATE OF SAMPLE 1961	LAB. NO.	5-DAY B.O.D.	SOLIDS			BACTERIOLOGICAL LABORATORY	
			TOTAL	SUSP.	DISS.	LAB. NO.	MEMBRANE FILTER COLIFORM COUNT PER 100 ML.
FEB. 28	R-367	80.0	374	70	304	SAMPLE BROKEN IN TRANSIT	
JULY 18	6116	70.0	406	56	350	R-7535	17,000,000
FEB. 28	R-364	62.0	418	82	336	R-1468	326,000

TABLE III

R-367 N.5.4 T - EFFLUENT FROM NAPANEE SEWAGE TREATMENT PLANT
6116

R-364 N.5.5 R - RELIEF OUTFALL FROM NAPIER STREET SEWAGE PUMPING STATION
NO FLOW JULY 18TH

SEWAGE ANALYSIS

MUNICIPALITY: COUNTY OF LENNOX & ADDINGTON

SOURCE: INDUSTRIAL WASTE DISCHARGES TO NAPANEE RIVER

DATE SAMPLED: SEE BELOW BY: A. MCCONNELL, R. BARRENS

DATE OF SAMPLE [196]	LAB. NO.	5-DAY B.O.D.	SOLIDS			PH AT LAB.	TURBIDITY IN SILICA UNITS	PHENOL IN (P.P.B.)	BACTERIOLOGICAL LABORATORY	
			TOTAL	SUSP.	DISS.				LAB. NO.	MEMBRANE FILTER COLIFORM COUNT PER 100 ML.
MAR. 1	R-378	300.	978	168	810	6.8	--	10	R-1496	100
MAR. 1	R-377	280.	720	102	618	6.2	--	45	R-1495	70
MAR. 1	R-374	2.1	268	--	--		3	--	R-1492	11
MAR. 1	R-373	280.	654	42	612				R-1491	211,000
JULY 17	R-2323	1200.	1542	548	994	--	--	--	R-7530	1,340,000

R-378 STRATHCONA PAPER CO. LTD. PLANT - INFLUENT TO FIRST WASTE TREATMENT LAGOON

R-377 (N.11.5 P1) STRATHCONA PAPER CO. LTD. - EFFLUENT FROM FINAL LAGOON TO NAPANEE RIVER
(PLANT NOT OPERATING DURING SUBSEQUENT SAMPLING IN JULY)

R-374 (N.N.13.9) TRIBUTARY OF NAPANEE RIVER UPSTREAM FROM NEWBURGH MILK PRODUCTS OUTFALL.
(NO FLOW ON JULY 17TH)

R-373) (N.N.13.8) TRIBUTARY OF NAPANEE RIVER DOWNSTREAM FROM NEWBURGH MILK PRODUCTS OUTFALL
R-2323)

TABLE IV

SEWAGE ANALYSIS

MUNICIPALITY: COUNTY OF LENNOX & ADDINGTON

SOURCE: PRIVATE SANITARY WASTE DISCHARGES TO NAPANEE RIVER

DATE SAMPLED: SEE BELOW BY: A. McCONNELL, R. BARRENS

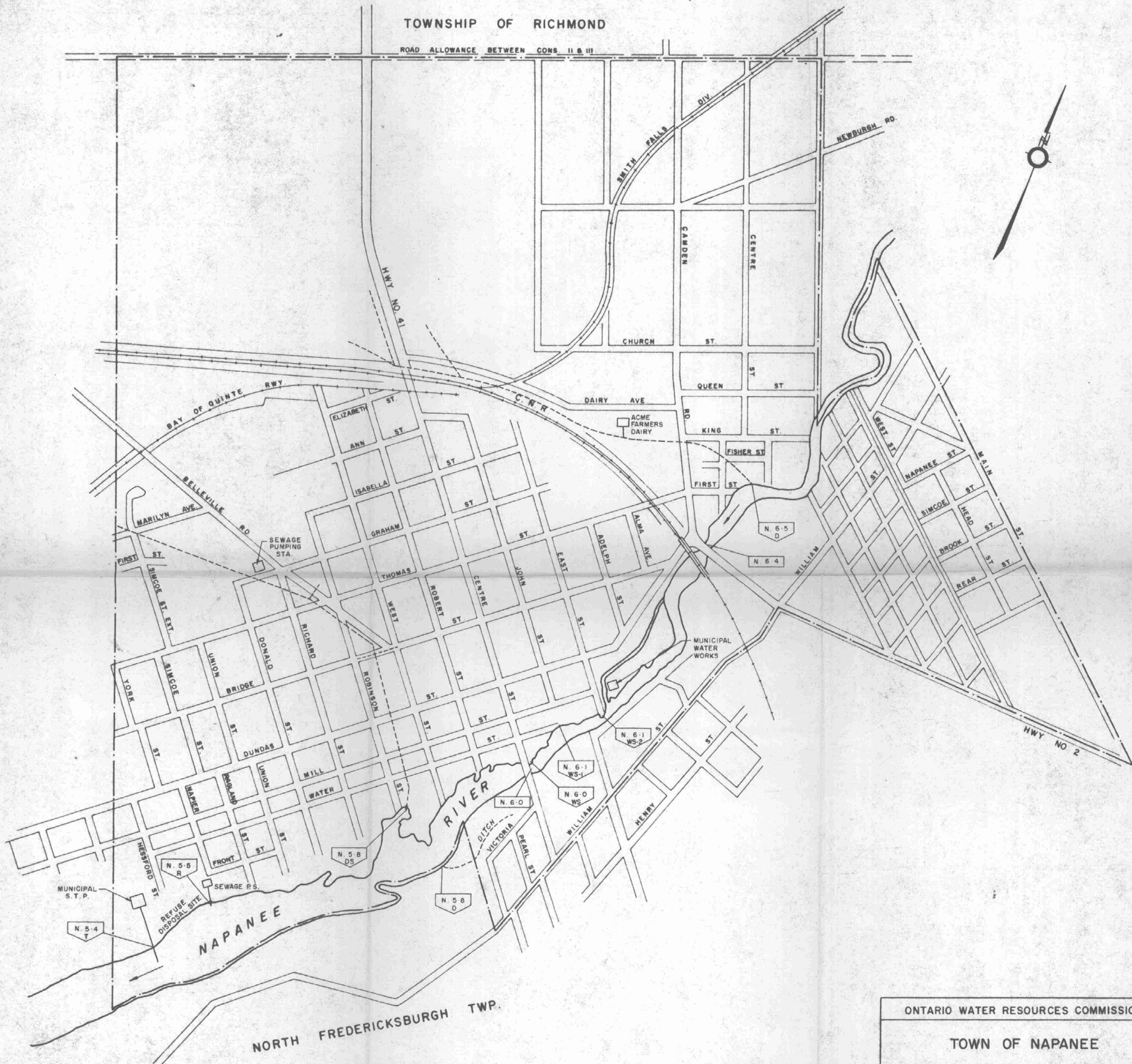
DATE OF SAMPLE <u>1961</u>	LAB. NO.	5-DAY B.O.D.	SOLIDS			BACTERIOLOGICAL LABORATORY	
			TOTAL	SUSP.	DISS.	LAB. NO.	MEMBRANE FILTER COLIFORM COUNT PER 100 ML.
MAR. 1	R-376	80.	488	56	432	R-1494	200
JULY 17		(INSUFFICIENT FLOW FOR CHEMICAL SAMPLE)				R-7537	4,700,000

T
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V

R-376 STRATHCONA PAPER CO. LTD. - SEPTIC TANK DISCHARGE TO NAPANEE RIVER
-- SAMPLE FOR BACTERIOLOGICAL EXAMINATION ONLY

TOWNSHIP OF RICHMOND

ROAD ALLOWANCE BETWEEN CONS II & III



LEGEND:

N. 5.5

- STREAM SAMPLING POINTS
SHOWING STREAM AND MILEAGE

N. 6.0
D

- OUTLET SAMPLE SHOWING
MILEAGE AND TYPE

--- TOWN LIMITS

TYPE OF OUTLET

W - WATER (STORM SEWER)
S - UNTREATED OR PARTIALLY TREATED SEWAGE
D - DITCH
T - SEWAGE TREATMENT PLANT
R - RELIEF SEWER

ONTARIO WATER RESOURCES COMMISSION

TOWN OF NAPANEE

MUNICIPAL SANITARY SURVEY
1961

SCALE

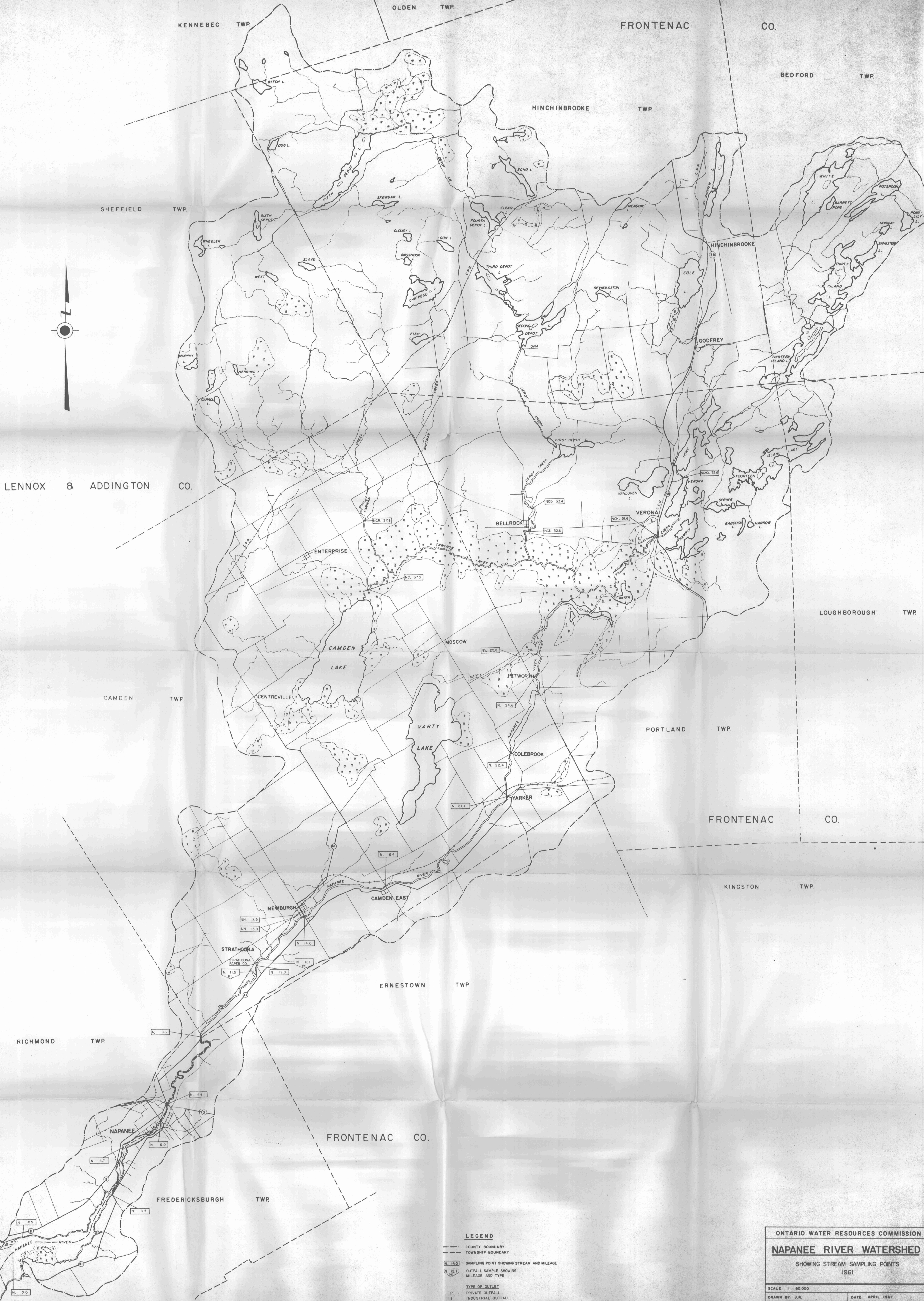
250' 0 250' 500' 1000'

DRAWN BY: J. H.

DATE: MARCH, 1961

CHECKED BY:

DRAWING NO: 61-20 A



LEGEND

- COUNTY BOUNDARY
- TOWNSHIP BOUNDARY
- N. 14.0 SAMPLING POINT SHOWING STREAM AND MILEAGE
- N. 12.1 OUTFALL SAMPLE SHOWING MILEAGE AND TYPE
- TYPE OF OUTLET
 - P PRIVATE OUTFALL
 - I INDUSTRIAL OUTFALL
 - S UNTREATED OR PARTIALLY TREATED SEWAGE

ONTARIO WATER RESOURCES COMMISSION

NAPANEE RIVER WATERSHED

SHOWING STREAM SAMPLING POINTS 1961

SCALE: 1 : 80,000

DRAWN BY: J.R. DATE: APRIL 1961

CHECKED BY: DRAWING No: 87-238

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